intellectual and moral philosophy. He has been an officer of the college since 1883. Dr. W. H. Sheldon has been transferred to the professorship made vacant by the retirement of Professor Campbell. Dr. Walter Van Dyke Bingham, now instructor in educational psychology in Teachers College, Columbia University, will join the Dartmouth faculty as an assistant professor of psychology.

At the University of Missouri, Dr. O. D. Kellogg has been advanced from the rank of assistant professor to that of professor in mathematics.

Dr. A. S. Pearse has been promoted to the position of assistant professor of zoology at the University of Michigan.

At Dartmouth College advances in grade from instructorships to assistant professorships have been voted to Charles E. Hawes, in anthropology, Leon Burr Richardson, in chemistry, and Dr. George Sellers Graham, in pathology.

H. S. Jackson has been appointed professor of botany and plant pathology in the Oregon Agricultural College. Mr. Jackson has been, since August, 1909, research assistant in plant pathology at the Oregon Agricultural Experiment Station.

Nels C. Nelson and Thomas T. Waterman have been appointed instructors and assistant curators in anthropology at the University of California.

Jacob Parsons Schaeffer, instructor in medical anatomy in the Ithaca division of the Medical College, has been promoted to an assistant professorship of medical anatomy.

Mr. T. Townsend Smith, at present the holder of the Tyndall fellowship in physics in Harvard University, has been elected instructor in physics in the University of Kansas.

DISCUSSION AND CORRESPONDENCE

THE DEFINITION OF FORCE

The discussion now going on in Science concerning the language to be used in explaining to students what force "is," must be of great interest to students. They will observe that there is good reason for the obscurity of their own vision. In the physics department, the student might finally learn to distinguish between the pound and the weight of a pound. In the engineering department he learns that a pound is a pound, and that the weight of a pound is also a pound. In the physics class he will be assured that the weight of a pound is different at different places. He will learn that the weight of the earth is equal to the weight of any other body which it attracts. The weight of the earth is equal to the weight of a pound, of a gram, of a ton or of the moon. In the engineering department he will be taught that the weight of the earth is equal to the weight of 1.35×10^{25} pounds. There was a time when the use of the phrase "conservation of forces" was excusable. We do not discredit Helmholtz for saying in 1854 that "nature as a whole possesses a store of force which can not in any way be either increased or diminished," or that "all force will finally pass into the form of heat." The words had not yet been given definite meanings, which would enable one to say what he had in mind.

The electrical engineers of our time have no difficulty in using modern notation. The mechanical engineers continue to use the good old definitions of Weisbach and Rankin. "Thus the British unit of force is the standard pound avoirdupois."

The notation which makes a proper distinction between the pound and the weight of a pound, or between mass and weight, or force, does not require us to say that force "is" a rate of change of momentum. Some of us prefer not to say this. In a lecture before the British Association at Glasgow in 1876, Tait made a rather strenuous attempt to enlighten Tyndall on the nature of force. In this lecture we are informed that "force is the rate of change of momentum." Again, it is stated that "unit force is thus that force, which, whatever be its source, produces unit momentum in unit time." In the discussion which followed this lecture a writer

in *Nature* suggested that there might be some difficulty in understanding how a certain rate of change of momentum could produce unit change of momentum per second. It was also suggested that, while we might measure the hunger of a man under various circumstances, by determining the number of pounds of beef he would consume, we should hardly be warranted in saying that hunger "is" a certain number of pounds of beef.

We shall probably continue to measure forces with spring balances. We shall always find that the force applied to a loaded wagon is greater than the change per second in its momentum. Tait's definition might give a zero value when the spring balance might show that the horse was behaving in a very creditable way.

FRANCIS E. NIPHER

SCIENTIFIC BOOKS

The Wonders of Animal Ingenuity. By H. COUPIN, D.Sc., and JOHN LEA, M.A., author of "The Romance of Bird Life." Philadelphia, J. B. Lippincott Company. 1910. Pp. 163.

This is an American reprint of an English book of popular natural history for young people, dealing with the "wonders" of the nest-building instinct in spiders, insects, fishes, birds and mammals. The facts are gathered largely from such authorities as Huber, Moggridge, Fabre and Brehm. They are treated entirely from the traditional point of view with regard to instinct, and despite a warning in the preface against attributing "human motives and reason where they have no existence," the "little architects" are more or less humanized throughout. It would seem that a no less popularly interesting book could now be written from the more modern point of view, dwelling on the failures and variability of instinct. However, for young English readers the book would no doubt accomplish the purpose set forth in the preface, of aiding "towards a greater love of animals and a desire to observe and understand their ways." But for the American reader its value is lessened by the fact that so few of the species whose behavior is described are natives of this country. This is especially true in the case of the birds: for instance, when the ovenbird is mentioned it is the South American *Furnarius rufus* that is meant, instead of our own little warbler, the discovery of whose nest is a pleasant achievement for any amateur naturalist.

MARGARET FLOY WASHBURN

Linseed Oil and other Seed Oils. An Industrial Manual. By WILLIAM D. ENNIS, M.E., Professor of Mechanical Engineering in the Polytechnic Institute of Brooklyn. 8vo, cloth, pp. 316. Price $4.00 net. New York, D. Van Nostrand Co. 1909.

This deals minutely with the production of linseed and other expressed oils, particularly cottonseed, sunflower, peanut and rape. A glance at the table of contents shows the wide scope of the book: this is as follows: Introductory, The Handling of Seed and the Disposition of Its Impurities; Grinding; Tempering the Ground Seed and Molding the Press Cake; Pressing and Trimming the Cakes; Hydraulic Operative Equipment; The Treatment of the Oil from the Press to the Consumer; Preparation of the Cake for the Market; Oil Yield and Output; Shrinkage in Production; Cost of Production; Operation and Equipment of Typical Mills; Other Methods of Manufacturing; The Seed Crop; The Seed Trade; Chemical Characteristics of Linseed Oil; Boiled Oil; Refined and Special Oils; The Linseed Oil Market; The Feeding of Oil Cake; Miscellaneous Seed Oils; The Cottonseed Industry.

The chapters on boiled and refined and special oils and the oil market are particularly instructive and valuable. Another chapter deals with the chemical testing of the oil, many of the methods being taken from the bulletins of the U. S. Department of Agriculture, Division of Chemistry. The method for the execution of the Maumené test can not be recommended. It is an open question as to whether chemical tests should be included in a manual of this kind.

[1] *Nature*, XVI., 182, 227.